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 SECURITY INFORMATION
 CENTRAL INTELLIGENCE AGENCY REPORT
 INFORMATION FROM
 FOREIGN DOCUMENTS OR RADIO BROADCASTS CD NO.

50X1-HUM

COUNTRY USSR DATE OF INFORMATION 1951
 SUBJECT Scientific - Medicine, blood substitutes, biographic
 HOW PUBLISHED Monthly periodical DATE DIST. 31 Oct 1951
 WHERE PUBLISHED Leningrad NO. OF PAGES 3
 DATE PUBLISHED Apr 1951 SUPPLEMENT TO REPORT NO.
 LANGUAGE Russian

50X1-HUM

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SOURCE Priroda, No 4, 1951, pp 83-85.I. F. LEONT'YEV'S WORK ON PROTEINS

Prof G. I. Roskin,
 G. G. Leongardt

The activity of Professor I. F. Leont'yev (1892 - 1950) was concentrated in two principal fields, biochemistry of proteins and biophysics of protoplasm. In the first field, his investigations leading to the preparation of nonantigenic proteins are of particular interest from the theoretical as well as practical standpoint. Basically, Leont'yev's work was concerned with the preparation of nonantigenic albumens from both human and animal sera.

This problem was solved in the USSR by Leont'yev in a generally valid manner long before American scientists had done work on the same subject. Leont'yev reported on his results in this field at the 115th International Congress of Physiology, Leningrad; 1935, and the second International Congress of Microbiology, London, 1936. The papers he presented on these two occasions described feasible procedures for the creation of technical conditions that assure the transformation of antigenic proteins of almost any origin into the corresponding nonantigenic proteins.

In the course of his work, Leont'yev showed that globulin from chestnuts, glycinin from soybeans, edestin from hemp seeds, phaseolin from the seeds of Phaseolus, myosin from frog muscles and from various invertebrate animals, caseinogen from the milk of rabbits or horses, and other proteins, after being transformed from biologically active sensitizers into inactive, nonantigenic substances, do not produce anaphylaxis or any of its symptoms in guinea pigs, dogs, cats, rabbits, white mice, white rats, pigeons, or chickens. Clinical tests demonstrated that these nonantigenic proteins, on being injected subcutaneously or intramuscularly, also do not produce any allergic reactions in humans. At this point Leont'yev began to consider the possibility of applying nonantigenic proteins as blood substitutes in clinical practice whenever the advisability of a blood transfusion might be indicated.

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To investigate this possibility, Leont'yev flooded the circulatory system of dogs, after appropriate bloodlettings, with 5% solutions of nonantigenic proteins. To prepare these solutions, the proteins were dissolved in osmotically equivalent salt solutions. The dogs tolerated the operation well and completely recovered within 3 days.

Leont'yev also established that erythrocytes of people who died suddenly can be preserved at pH = 7.2 in mixtures of citrate plasma from the blood of corpses and an isotonic solution of nonantigenic protein. No hemolysis occurred, and the erythrocyte suspension was preserved for the maximum period permissible for the storage of donor blood.

He further established that erythrocytes of a dog, when suspended in a sterile solution of nonantigenic protein, could be injected into the blood stream of another dog without ill effects.

These experiments showed that salt solutions of nonantigenic proteins may be regarded as suitable carriers for erythrocytes of mammals. While these proteins are insoluble in water, they are soluble in Ringer-Lock salt solutions, as well as in solutions of salts consisting of both organic and inorganic cations and anions. Clinical tests on human patients demonstrated that a solution of nonantigenic protein, called "naprin" by Leont'yev, is an excellent substitute for whole, citrate blood. When injected intravenously in concentrations corresponding to those of plasma proteins, and after having been combined with universal, whole, citrate blood, (in doses of 200-250 ml), nonantigenic protein was tolerated by the patients. No complications whatever developed. Results obtained in this work conclusively prove that naprin is a suitable agent for doubling the available quantity of donor blood.

Positive results were also obtained when naprin solutions were tested as a vehicle for the preservation and therapeutic application of erythrocytes which are otherwise lost in the mass production of blood plasma from human blood.

Academician N. F. Gamaleya, who had a very high opinion of Leont'yev's work on nonantigenic proteins, held that Leont'yev's discovery to the effect that protein acids of a particular origin do not produce anaphylaxis, must undoubtedly be regarded as one of the most important advances in this field.

Of great interest also is Leont'yev's finding that certain pharmacologically active, but excessively toxic, compounds can be detoxified by combining them with proteins. Thus, he established that nicotine caseinate does not exert any toxic effect on the heart.

Another important series of Leont'yev's investigations is devoted to experimental determinations of the specific gravity of protoplasm. The method applied by Leont'yev consisted in measuring the rate at which cells fell through a medium of known specific gravity. The cells were observed by means of a horizontally placed microscope. The specific gravity of the protoplasm could then be calculated on the basis of Stokes' law. On carrying out measurements of the specific gravity of bacteria by this method, Leont'yev used the results thus obtained by him in studies of the response of the bacteria in question to changes of environment, in evaluations of the effect of chemotherapeutic agents, etc.

Leont'yev graduated from St Petersburg University in 1916. During 1918 - 1921, he was instructor of animal physiology at the Agricultural Faculty of the Polytechnic Institute in that city, and, at the same time, was in charge of the worker's faculty at the institute. During 1922 - 1925, Leont'yev was head of the Biochemical Laboratory of the Institute of Infectious Diseases imeni Mechnikov at Moscow.

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In 1919, he published his first original scientific paper. During 1924 - 1926, he published a number of papers on the biophysics of lower organisms and the specific gravity of protoplasm. During 1926 - 1930, he worked at the Institute of Biology imeni Timiryazev, and from 1931 to 1938, at the Laboratory of Proteins, VASKhNIL (All-Union Academy of Agricultural Sciences imeni V. I. Lenin). In 1936, the degree of Doctor of Biological Sciences was conferred on Leont'yev. In the period 1927 - 1941, he published the bulk of his scientific work (more than 40 papers). At the outbreak of World War II, Leont'yev worked at the Laboratory of Biophysics, Academy of Sciences USSR. From 1947 until his death in 1950, he was active at the Laboratory of the Biotherapy of Cancer, Academy of Medical Sciences USSR, where he was in charge of the Biophysical Department. In 1917, Leont'yev became a contributor to Priroda, and continued to work for this magazine during the remaining 33 years of his life.

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